

SECTION 02731

MANHOLES, WETWELLS AND MANHOLE COVERS

PART1 GENERAL

1.1 REFERENCES

- A. ASTM A48 - Gray Iron Castings.
- B. ASTM C478 - Precast Reinforced Concrete Manhole Sections.
- C. ASTM C923 - Resilient Connectors Between Reinforced Concrete Manhole Structures and pipes.

1.2 SUBMITTALS

- A. Submit under provisions of Section 01300.
- B. Shop Drawings: Indicate manhole locations, invert elevations, sizes and elevations of penetrations.
- C. Product Data: Provide manhole covers, component construction, features, configuration, and dimensions.

1.3 QUALIFICATIONS

- A. Manufacturer: Company specializing in manufacturing products specified in this section with minimum three years documented experience.

PART 2 PRODUCTS

2.1 MATERIALS

- A. Manhole Sections: Reinforced precast concrete in accordance with ASTM C478. Reinforced cast-in-place concrete as specified in Section 03001 will be allowed on a case by case basis with WSD approval.

2.2 COMPONENTS

- A. Cover and Frame: ASTM A48, Class 30B lid molded with the words, "SANITARY SEWER".

1. Traffic Type: "Number 1150" John Bouchard or approved equivalent.
 2. Non-Traffic Type: "Number 1155," John Bouchard or approved equivalent.
 3. Watertight Type: "Number 1150 or 1155 with bolts and gasket," John Bouchard or approved equivalent.
 4. Shallow Type: "Number 1312", John Bouchard or approved equivalent.
 5. Shallow Watertight Type: "Number 1312 with bolts and T-gasket", John Bouchard or approved equivalent.
 6. Composite Type: GMI Composites, Model 2600 or approved equivalent.
- B. Manhole Steps: Either of the following:
1. Formed aluminum rungs; 3/4 inch diameter. Formed integral with manhole sections.
 - a. "Part 12653B," Alcoa
 - b. "PSI-45," M. A. Industries
 2. ASTM C478; injection molded, copolymer polypropylene plastic covered, Number 4, Grade 60, rebar; 5-3/4 inches projection, 12 inches overall width, 9-1/8 inches overall depth; serrated tread; 1500 pounds pullout strength.
 - a. Model "PS1-PF," M. A. Industries, Inc., Peachtree City, GA.
- C. Base Pad: Either precast concrete type or cast-in-place concrete with reinforcement of type specified in Section 03001. Top of poured base shall be level.
- D. Manhole Inverts: Form from concrete as shown on Standard Drawings. Form inverts for a "straight-thru" manhole by laying pipe straight through manhole, pouring concrete invert, and then breaking out top half of pipe. Construct curved inverts of concrete as shown and form a smooth, even half-pipe section as shown. Inverts formed by precast manufacturer are also acceptable.
- E. Pipe Connectors: Flexible pipe-to-manhole EPDM gaskets in accordance with ASTM C923; with non-magnetic 304 stainless steel wedge type expander and pipe clamp; tested without leakage to the following:
1. Head pressure of more than 10 psi for 10 minutes per ASTM C923-7.1; Deflection of over 7 degrees in any direction per ASTM C923-7.2.2; Load of over 150 pounds per inch pipe diameter per ASTM C923-7.2.3.
 2. "Kor-N-Seal", Type I or Type II, Toggle Style specifically suited for wastewater applications as manufactured by Trelleborg.

- F. **Joint Sealant:** One strip of flexible plastic sealant for joints in pre-cast manhole sections shall be installed on the tongue and groove sections of the precast manholes to provide permanent flexible watertight joints which shall remain workable over wide temperature ranges and shall not shrink, harden or oxidize upon aging. Two (2) strips of sealant shall be used on wet well joints. Material shall be butyl resin sealant ConSeal CS-102 or CS-202 as manufactured by Concrete Sealants, Inc. of New Carlisle, Ohio, RUB'R-NEK L-T-M manufactured by K.T. Snyder Company, or other approved equal.

- G. **Exterior Joint Wrap:** Joint wrap shall be installed at all joints between riser sections in accordance with ASTM C909. Joint wrap shall be 6-inch minimum width, EZ-WRAP as manufactured by Press-Seal Gasket Corporation, or other approved equal.

- H. **Grade Adjustment Ring:** Reinforced concrete adjustment rings shall be allowed up to 12 inches in height. Adjustment casting by the use of adjustment rings in excess of 12 inches in height shall not be permitted. No grade adjustment rings shall be utilized where top of pre-cast section is scheduled to remain above the existing grade.

- I. **Chimney Seals:** On all manholes in easements, an internal manhole frame seal shall be installed from the frame down to the top of the manhole cone.
 - 1. The manhole frame seal shall be designed to prevent leakage of water through the chimney/frame area throughout a 50 year design life. The seal shall also be designed so that it can be installed in manholes where the diameters of the frame and chimney differ by up to 20%.
 - 2. The frame seal shall be capable of repeated vertical movement of not less than 2 inches and/or repeated horizontal movement of not less than ½ inch after installation and throughout its design life.
 - 3. Frame seals shall consist of a flexible internal rubber sleeve and stainless steel expansion bands conforming to the following requirements:
 - 4. Rubber sleeve – The flexible rubber sleeve shall be extruded or molded from a high grade rubber conforming to the material requirements of ASTM C923 with a minimum 1500 psi tensile strength, a maximum 18% compression set and a hardness (durometer) of 48±5. The sleeve shall be double, triple or quadruple pleated with a minimum unexpanded vertical height of 8-inches, 10-inches or 13-inches respectively and a minimum thickness of 3/16 inches. The top and bottom section of the sleeve that compresses against the manhole frame casting and the chimney/cone shall have an integrally formed expansion band and a series of sealing fins to facilitate a watertight seal.

5. The top section of the extension shall have a minimum thickness of 3/32 inches and shall be shaped to fit into the bottom band recess of the sleeve under the bottom chimney seal band and the remainder of the extension shall contain an integrally formed expansion band recess and multiple sealing fins matching that of the rubber sleeve.
6. Expansion bands – The expansion bands used to compress the sleeve against the manhole shall be integrally formed from 16 gauge stainless steel conforming to the requirements of ASTM C923, Type 304 with no welded attachments and shall have a minimum width of 1-2/4 inches. The bands shall have a minimum adjustment range of 2-1/2 diameter inches and the mechanism used to expand the band shall have the capacity to develop the pressure necessary to make a watertight seal. The band shall be permanently held in place with a positive locking mechanism which secures the band in its expanded position after tightening.
7. Internal manhole frame seals shall be Cretex Specialty products Internal Chimney Seals or approved equal.

2.3 CONFIGURATION

- A. Shaft Construction: Eccentric cone top section; lipped male/female dry joints; sleeve to receive conduit sections. For wetwells and shallow-type manholes, precast flattop manhole sections are required with appropriate sized openings.
- B. Shape: Cylindrical.
- C. Clear Inside Dimensions: Manholes shall be 48 inch diameter, minimum, for depths up to 12 feet. For manholes greater than 12 feet and up to 18 feet in depth, diameter shall be 60 inch, minimum. For manholes greater than 18 feet in depth, utilize 72 inch base section (minimum 6 feet high) with transition section to 48 inch diameter risers and cone.
- D. Design Depth: As indicated.
- E. Clear Lid Opening: 26 inches diameter minimum opening required for manholes. Opening for wetwells is as required by plans.
- F. Pipe and Conduit Entry: Provide openings as required with resilient pipe connectors.
- G. Steps: 12 inches wide, 15 inches on center vertically, set into manhole wall. Steps are not permitted inside wetwells.

2.4 FABRICATION

- A. Manhole sections showing evidence of cracking, crazing, honeycombing, crumbling, or excessive roughness will not be accepted. Manhole sections with improper cut-outs for pipes will not be acceptable. Poorly finished or ill-fitting manhole sections will be rejected.
- B. Castings shall be first quality, free from blow holes, shrinkage, distortion, or other defects.
- C. Manholes shall be smooth and well-cleaned, and shall be coated with Xypex Admix C-1000. Using normal practices to ensure formation of homogeneous mixture. PRECAST BATCH PLANT – PAN TYPE MIXER: Add Xypex Admix to the rock and sand, then mix thoroughly for 2-3 minutes before adding the cement and water. The total concrete mass should be blended using standard practices. A red colorant shall be added to verify the Xypex Admix was added to the concrete.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Verify items provided by other sections of Work are properly sized and located. Verify that built-in items are in proper location, and ready for roughing into Work. Verify excavation for manholes is correct.

3.2 PREPARATION

- A. Coordinate placement of inlet and outlet pipe required by other sections or plans.

3.3 PLACING MANHOLE SECTIONS

- A. Place base pad, trowel top surface level. At manholes 14'-0" and over in depth, provide an 8 inch lean concrete footing as shown on Standard Drawings.
- B. Place prefabricated manhole sections plumb and level, trim to correct elevations, anchor to base pad.
- C. Form and place cast-in-place concrete manhole cylinder plumb and level, to corrections dimensions and elevations. As work progresses, build-in fabricated metal items.
- D. Cut and fit for conduit and sleeves.

- E. Grout base of shaft sections to achieve slope to exit piping. Trowel smooth. Contour as required.
- F. Form manhole inverts from concrete as shown on Standard Drawings. Slope bench uniformly to trough. Slope inverts at same slope as sewer either entering or leaving manhole. Minimum elevation difference between inlet pipe(s) and outlet pipe is 0.2 feet.
- G. Install drop inlet assemblies at manholes in which difference of flow lines is more than 24 inches. For differences of flow lines less than 24 inches, slope manhole invert to connect grades.
 - 1. Drop Inlet Assemblies: Stacks placed adjacent to manhole supported by poured concrete, as shown on Standard Drawings.
- H. Set cover frames and covers level without tipping, to correct elevations.
- I. Set top of manhole covers level with surrounding ground or as otherwise directed by the WSD. Grade so that no water will flow into manhole cover or stand on cover.
- J. Trim and remove excess joint material on inside walls.
- K. Manhole lids shall set flat in frame without rocking. Rocking covers shall be corrected by use of a grinder, or shall be replaced.
- L. Precast manhole adjustment rings may be used as outlined in Paragraph 2.2.H for final grade adjustment. No brick adjustment of casting will be allowed.
- M. Vacuum Testing of New Manholes:
 - 1. This test is only applicable to pre-cast concrete manholes.
 - 2. All lifting holes and exterior joints shall be filled and pointed with an approved non-shrink mortar.
 - 3. Each manhole shall be vacuum tested immediately after installation or rehabilitation and prior to backfilling. No standing water shall be allowed in the manhole excavation which may affect the accuracy of the test.
 - 4. All pipes and other openings into the manhole shall be suitably plugged in such a manner as to prevent displacement of the plugs while the vacuum is drawn.
 - 5. Installation and operation of the vacuum equipment and indicating devices shall be in accordance with equipment specifications and instructions provided by the manufacturer.
 - 6. The test head shall be placed to include the manhole casting (frame).

7. A vacuum of 10 inches of mercury shall be drawn. The time for the vacuum to drop to 9 inches shall be recorded.
8. Acceptance for four (4) feet diameter manholes shall be defined as when the time to drop to 9 inches of mercury conforms to the table below. Contractor shall keep a log of all tests which shall be submitted to the Engineer for approval.

<u>Manhole Depth</u>	<u>Time to Drop One (1) Inch</u>
10 feet or less	60 seconds
10.1 feet to 15 feet	75 seconds
15.1 feet to 25 feet	90 seconds

9. For manholes five (5) feet in diameter, add an additional 15 seconds. For manholes six (6) feet in diameter (or having a six (6) feet diameter base), add an additional 30 seconds.
 10. If the manhole fails the test, necessary repairs shall be made and the vacuum test repeated until the manhole passes the test.
 11. If the manhole joint mastic or gasket is displaced during the vacuum test, the manhole shall be disassembled, the seal replaced, and the manhole re-tested.
 12. No additional payment will be made for testing and cost shall be merged into cost of manholes.
- N. Where a sewage force main enters a manhole, the cover and frame on the three downstream manholes (new or existing), including the one containing the force main connection, shall be GMI Composite Manhole Frame and Cover with minimum 26" clear opening and 1/4" turn paddle locks or approved equivalent. Manholes shall also be coated with spray applied epoxy resin (Level Yellow) as per Section 02765 and subsequently tested in accordance with Paragraph 3.3.M of this Section.
- O. Coordinate with other sections of work to provide correct size, shape, and location.

END OF SECTION 02731 - MANHOLES, WETWELLS AND MANHOLE
COVERS

